

What is claimed:

1. A coating composition comprising:
  - a. a phenolic resin;
  - 5 b. an alkoxysilane; and
  - c. an acid.
2. A coating composition according to claim 1 wherein said alkoxysilane has a molecular weight that is not greater than 50,000.
- 10 3. A coating composition according to claim 1 in which the alkoxy group of the alkoxysilane contains from 1 to 6 carbon atoms.
4. A coating composition according to claim 2 wherein said alkoxysilane  
15 is an epoxy functional alkoxysilane.
5. A coating composition according to claim 1 wherein said acid is tannic acid.
- 20 6. A coating composition according to claim 1 wherein said acid is phosphoric acid.
7. A coating composition according to claim 1 wherein said acid is citric  
25 acid.
8. A coating composition according to claim 1 wherein said acid is gallic acid.
9. A coating composition according to claim 1 wherein said phenolic  
30 resin is prepared by condensing a phenolic material with an aldehyde.

10. The coating composition of claim 9 wherein the phenolic material is phenol.

11. The coating composition of claim 9 wherein the aldehyde is formaldehyde.

12. A coating composition according to claim 1 wherein said phenolic resin has an aromaticity between 0 and 80 percent.

13. A coating composition according to claim 1 wherein said phenolic resin is present in an amount ranging from 0.1 to 99.8 percent by weight based on the total weight of the coating composition.

14. A coating composition according to claim 1 wherein said alkoxysilane is present in an amount ranging from 0.1 to 99.8 percent by weight based on the total weight of the coating composition.

15. A coating composition according to claim 1 wherein said acid is present in an amount ranging from 0.1 to 99.8 percent by weight based on the total weight of the coating composition.

16. A coating composition comprising:

a. from 0.1 to 99.8 percent by solid weight of a phenolic resin;

b. from 0.1 to 99.8 percent by solid weight of an epoxy functional alkoxysilane; and

c. from 0.1 to 99.8 percent by solid weight of an acid selected from the group comprising tannic, phosphoric, citric and gallic acids, whereby the percents by weight are based on the total solid weight of the

composition.

17. The coating composition of claim 16 wherein the epoxy functional silane has a molecular weight no greater than 1,000.

5 18. The coating composition of claim 16 wherein the alkoxy groups of the alkoxy silane contain from 1 to 6 carbon atoms.

19. The coating composition of claim 16 wherein the acid is tannic acid.

10 20. The coating composition of claim 12 wherein the phenolic resin has an aromaticity between 15 and 80 percent.

21. A coating composition comprising:

15 a. from 0.1 to 99.8 percent by weight of a phenolic resin having an aromaticity between 15 and 80 percent;

b. from 0.1 to 99.8 percent by weight of an epoxy functional silane having a molecular weight that is not greater than 1000 in which the alkoxy groups contain from 1 to 6 carbon atoms; and

20 c. from 0.1 to 99.8 percent by weight of an acid selected from the group comprising tannic, phosphoric, citric and gallic acids, whereby the percents by weight are based on total solid weight of the composition.

22. A solvent-based coating composition comprising:

25 a. a phenolic resin;  
b. an alkoxy silane;  
c. an acid; and  
d. an organic solvent.

23. A coating composition according to claim 22 wherein said alkoxysilane has a molecular weight no greater than 1,000.

24. A coating composition of claim 22 in which the alkoxy group of the  
5 alkoxysilane contains from 1 to 6 carbon atoms.

25. A coating composition according to claim 22 wherein said alkoxysilane is an epoxy functional silane.

10 26. A coating composition according to claim 22 wherein said acid is tannic acid.

27. A coating composition according to claim 22 wherein said acid is phosphoric acid.  
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28. A coating composition according to claim 22 wherein said acid is citric acid.

29. A coating composition according to claim 22 wherein said acid is  
20 gallic acid.

30. A coating composition according to claim 22 wherein said solvent is selected from the group consisting of ketones, alcohols and aromatic hydrocarbons.

25 31. A solvent-based coating composition comprising:  
a. a phenolic resin;  
b. an epoxy functional silane;  
c. a tannic acid; and  
d. an organic solvent.

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32. A coated substrate coated with a coating composition comprising:

- a. a phenolic resin;
- b. an alkoxysilane; and
- c. an acid.

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33. A coated substrate according to claim 32 wherein the substrate is cold rolled steel, electrogalvanized steel, or aluminum.

34. A coated substrate derived from the coating composition of claim 16.

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35. A method for coating a substrate comprising the following steps:

a. applying a controlled thickness of a coating composition comprising a phenolic resin, an alkoxy silane, and an acid;

b. applying a primer coating over the coating applied in step (a);

and

c. applying a topcoat over the coating applied in step (a) or in optional step (b).

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36. A method for coating a substrate according to claim 35 wherein the

20 alkoxysilane is an epoxy functional silane.

37. A method for coating a substrate according to claim 35 wherein the acid is tannic acid.

25 38. A method for coating a substrate according to claim 35 wherein the phenolic resin is prepared by condensing a phenolic material with an aldehyde.

39. A method for coating a substrate according to claim 35 wherein said phenolic resin is present in an amount ranging from 0. 1 to 99.8 percent by weight  
30 based on the total weight of the coating composition.

40. A method for coating a substrate according to claim 35 wherein said alkoxysilane is present in an amount ranging from 0.1 to 99.8 percent by weight based on the total weight of the coating composition.

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41. A method for coating a substrate according to claim 35 wherein said acid is present in an amount ranging from 0.1 to 99.8 percent by weight based on the total weight of the coating composition.

TECHNICAL FIELD